ERVING THE PROFESSION OF ENGINEERING

WESTERN SOCIETY OF ENGINEERS'

91 ST YEAR

Midwest Engineer

CONTENTS

■

October, 1960

Vol. 13, No. 2

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A STUDY IN STAINLESS STEEL

An all-stainless steel bodied Thunderbird is shown against the background of the stainless steel buildings at Gateway Center in Pittsburgh. The automobile was made for Allegheny Ludlum Steel Corporation, and will be shown in automobile and other shows around the country.

Here's the Call . . .
What's Your Answer?

The Western Society of Engineers has been asked to sponsor a two- or three-day short course in Use-Inspection-Design of Prestressed Concrete.

Would you be interested in attending such a course?

If you are interested, call or write your Society at once to that effect. Whether such a course is held depends to a great extent upon your response at this time.

Write to the Western Society of Engineers, 84 East Randolph St., Chicago 1, Ill., or call RAndolph 6-1736. If you are interested, do it today.

Midwest Engineer

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Is it the Proper Thing to do?

NOTE: This column deals with standards of conduct in the engineering field. The editor invites comments and criticisms on the ethical problems considered herein. Questions submitted on engineering ethics will be given careful attention. You should address your letter: The Editor, Midwest Engineer, 84 E. Randolph St., Chicago 1, Ill.

QUESTION: Is it ethical for an engineering administrator to have his name on a paper, the scientific and/or technical principles of which have been developed by the group under his administration?

REPLY: In general, it is unethical, and highly so, for an engineer, or anyone, to claim directly or by implication, credit for work or ideas not his own. Only the names of the principal authors and technical contributors should be listed as coauthor of the paper. Credit for all contributions by others mentioned in the paper should be set forth in detail in the article. An "acknowledgment" in the paper should grant proper credit to the institution or organization sponsoring the project, give the name and address of the place where the work was carried forward, and list the names and titles of the principal officers of the administration.

It is relevant to add that if the engineering administrator made important scientific or technical contributions to the work, then his name can appear ethically as an author.*

***An opinion of the Panel on Engineering Ethics of the Division on Education and Research of the Western Society of Engineers.**

Calendar of Chicago Engineering

—OCT. 19, WED., WSE Noon Luncheon Meeting, 12:00 noon. At WSE Hq.
—OCT. 19, WED., WSE Civic Committee Dinner (6:15 p.m.) and Meeting. At WSE Hq.
—OCT. 20-21, THURS.-FRI., 16th Annual National Conference on Industrial Hydraulics. Sponsored by Illinois Institute of Technology. At Hotel Sherman.
—OCT. 25, TUES., WSE General Meeting and Dinner. Social Hour (5:15-6:15 p.m.). Dinner (6:30). Technical Sessions (8:00). At WSE Hq.
—OCT. 26, WED., WSE Noon Luncheon Meeting, 12:00 noon. At WSE Hq.
—OCT. 31, MON., Young Engineers Forum. Social Hour (5:30-6:00 p.m.). Dinner (6:15). At WSE Hq.
—NOV. 1, TUES., Investment Casting Clinic, sponsored by Investment Casting Institute, 8:30 a.m.-5:00 p.m. At Hotel North Park.
—NOV. 2, WED., WSE Noon Luncheon Meeting, 12:00 noon. At WSE Hq.
—NOV. 9, WED., WSE Noon Luncheon Meeting, 12:00 noon. At WSE Hq.
—NOV. 9, WED., West Suburban Division Dinner (6:30 p.m.) and Meeting (7:40 p.m.). At Remick's Lilac Lodge, Wolf and Cermak roads, Hillside, Ill.
—NOV. 16, WED., WSE Noon Luncheon Meeting, 12:00 noon. At WSE Hq.
—NOV. 16, WED., WSE Civic Committee Dinner (6:15 p.m.) and Meeting. At WSE Hq.

Rust Bane A Boon

Chemists in West Germany have developed a liquid compound that converts rust into a waterproof protective film, reports *Construction Methods and Equipment*. The rust converter can be applied with a brush or sprayer and can serve as an undercoat for all standard finishes.

How to Keep A Cool Head

An air-conditioning unit that can be worn over the head has been devised, *Construction Methods and Equipment* reports. It consists of a fiber glass helmet and face plate connected to a portable, electrically-powered refrigeration system. The system provides a flow of cool air over the head and shoulders.

Marianne Fashingbauer poses for her picture after having entertained Western Society members and guests over coffee.

Howard Carter, Program Chairman for WSE for the year '60-61, pauses a moment before opening the meeting in the WSE Dining Room.

Mr. Carter, recently retired from the American Medical Association, acted as Engineering Ethics panel Moderator.

Panelists George T. Jacobi, left, and William J. Bachman, at the Dining Room Speaker's Table.

James Thompson, right, and fellow-panelist Professor Obert who came clear from Madison, Wisc., to "make just one point."

Anthony Zummer, left, attorney, was a panelist. Professor L. T. Wyly had a different duty—that of Question Editor.

Western Zips Through Its First Meeting On Sept. 27

There was neither shouting nor shaking of fists, and there was no pounding on tables. But there was the pointing of fingers, and pointed fingers can be quite emphatic. (See picture below.)

What was going on? What was breaking the usual pattern of sound within the sedate and sequestered halls of the Western Society of Engineers?

"What was going on" was a panel discussion on Engineering Ethics. This included questions and opinions from the audience.

Moderator for the event, which lasted well after 10:00 p.m., was Howard A. Carter, partner in the firm of Carter and Holmquest Technical Services. Mr. Carter is also the Society's program chairman for this year.

Professor L. T. Wyly of the Department of Engineering, Northwestern University, and a long-time member of the Western Society, was the Question Editor.

The Panel itself consisted of William J. Bachman, President, Chicago Chapter, American Institute of Architects; George T. Jacobi, Assistant Director of Research, Electronic Division, Armour Research Foundation; Professor Edward F. Obert, Department of Mechanical Engineering, University of Wisconsin; James Thompson of Dames & Moore, Chicago; and Anthony Zummer, Attorney with the firm of Stone, Nierman, Burmeister & Zummer, in Chicago. Mr. Zummer, a member of the Western Society, is also a Mechanical Engineer.

The panel discussion was a part of the Society's Kick-off Dinner on September 27, 1960.

Earlier in the evening Western Society members enjoyed the customary Social Hour (5:15-6:15 p.m.) in the Society Lounge, and at 6:30 p.m., dinner in the fifth floor Dining Room.

The talented accordionist, 17-year-old Marianne Fashingbauer, then entertained those in attendance with a variety of musical selections. Miss Fashingbauer is the Chicago Music Festival accordion solo winner.

September 27 at Western was an evening with zest and zip, all the way around.

Professor Obert, left, makes several points with one fell swoop—at least tries to—as Gerald M. Marks makes one emphatic point—or tries to—at the end of the panel discussion. They continue their discussion (above), but manifest disagreement.

Nonferrous Metals

★ Historical Notes

★ Properties, and

★ Applications

by Frank A. Crossley

Part 2 of 2 parts

Manganese

The first metallic manganese was probably prepared by Ignatius Gottfried Kaim, who described it in his dissertation "De metallis dubis," which was published in Vienna in 1770. The important manganese minerals are pyrolusite (MnO_2), rhodochrosite ($MnCO_3$), and rhodonite ($MnSiO_3$). Principal producers of manganese ores are Brazil, Ghana, India, South Africa, Russia, and the United States.

Ninety per cent of the manganese consumed in this country is used in making steel. It is also used as an alloying addition in nonferrous metals, e.g., aluminum, copper, and magnesium. Some manganese is used for special purpose manganese-base alloys such as one containing 20 per cent copper. This alloy is used for its very high damping capacity.

Mercury

Mercury or quicksilver has been found in Egyptian tombs dating back to 1500 or 1600 B.C. It is mentioned in the writings of Aristotle, Pliny the Elder, and others. The ancients obtained it from its ore, cinnabar. Mercury was recognized as a true metal in the winter of 1759-1760, when A. Braune and M. V. Lomonosov of the Academy of Sciences of St. Petersburg, Russia, unintentionally froze it at $-40°C$ ($-40°F$).

Cinnabar is found all over the earth, but occurrences which are sufficiently concentrated to be worked are rare. The Almaden mine in Spain has been worked continuously for more than 2000 years and is still the largest mercury producer in the world. The Idria mine in Austria has been in operation for more than 460 years. The principal producers of mercury are: Italy, Spain, the United States, and Mexico.

Mercury has more than 300 end uses. Its significant properties are: high specific gravity, fluidity at ordinary temperatures, electrical conductivity, the properties of its vapor, the poisonous quality of its compounds, its ability to amalgamate and form alloys, and its usefulness as a catalyst. Uses of mercury are pharmaceutical preparations; chemicals used in agriculture; phenylmercuric acetate (PMA), a killer of crabgrass in lawns; chemicals for controlling microorganisms; industrial and control instruments such as barometers, flowmeters, gas-pressure and tank gages, Sperry gyroscopes; clutches for small electrical motors used for washing machines, air-conditioning units, refrigeration equipment and other applications; electrical apparatus, catalysts, mercury-vapor boilers for generating power; and precision casting replacing the older method of using a wax or plastic master pattern.

Molybdenum

Molybdenum disulfide looks so much like graphite that until the latter part of the 18th century they were both sold under the same name: "Molybdän" or "molybdenum." Bengt (Andersson) Qvist suggested in 1754 that native MoS_2 contained something metallic besides iron, copper and tin. Later, Torbern O. Bergman suggested that the molybdic acid produced by Carl Wilhelm Scheele was the oxide of a new metal, and in 1781 his friend, Peter Jacob Hjelm, successfully reduced the oxide to the metal. These contributors to the discovery of molybdenum were all Swedish.

The chief commercial minerals of molybdenum are molybdenite (MoS_2), wolferite ($PbMoO_4$), and molybdite ($Fe_2O_3 \cdot 3MoO_3 \cdot 7H_2O$). The most important deposit in this country is located at Climax, Colorado, and averages 0.6 per cent molybdenite, the most common of the molybdenum minerals. Molybdenum recovered as a by-product of

copper and tungsten operations exceeded production from mines operated solely for molybdenum between 1945 and 1950. The greater part of the world's output of molybdenum is produced by the United States.

Primary consumption of molybdenum is as an alloying addition in steel and cast iron. Properties of molybdenum which make it useful are: high melting point 2620°C (4750°F), formability, strength at high temperatures, high electrical and thermal conductivity, high thermal shock resistance, and low specific heat and corrosion resistance. It is used for filament supports, hooks, etc., in incandescent lamps, and radio tubes; heating elements in electric resistance furnaces; in transistors and rectifiers; for die casting dies and cores, hot work tools, boring bars, resistance welding electrodes and dies, cladding, molds; in the construction of X-ray tubes; and in electrical contact points. Other uses are in the nuclear energy, chemical, glass, and metallizing industries.

The demand for materials to withstand the higher temperatures generated in military jet engines and missile rocket motors has stimulated extensive research efforts to find a means for protecting molybdenum from catastrophic oxidation in oxidizing atmospheres at temperatures above 1600°F. Sufficient progress has been made so that some applications are being made in rockets and missiles, jet engines, air frames, accessories, and rocket test sleds.

Nickel

Centuries before the discovery of nickel, primitive people shaped meteoric iron-nickel into implements and swords. An alloy containing nickel was used in China long before the metal was known in Europe. Nickel was discovered by Alex Fredrik Cronstedt (Swedish) in 1751. "Nickel," like "Kobold," means deceptive little spirit. German miners called the ore Kupfernickel, which may be translated "false copper."

There are only two nickel deposits in the world of any importance. One is on the island of New Caledonia in the South Pacific, and the other is near Sudbury, Ontario. Since 1886, when the Sudbury deposits were developed, Canada has led the world in nickel production. Nickel is found in nature in only two forms—as a complex silicate $[H_2(NiMg)SiO_4 \cdot H_2O]$ and as a sulfide associated with sulfides of iron and copper. The New Caledonia deposit is the largest of the former type, and the Sudbury deposit is the largest of the latter type.

Properties of nickel which determine its importance are corrosion resistance, oxidation resistance at elevated temperatures, its ability to confer corrosion resistance to steel and copper-base alloys through alloying, and its magnetic properties.

The most important use of nickel is in steel, either alone or in combination with other alloying elements. Perhaps the best known steel containing nickel is "18-8," the Type 304 stainless steel containing 18 per cent chromium and 8 per cent nickel. About one-quarter of the nickel produced appears as metallic nickel and nickel-base alloys. These are used for cooking utensils; high-temperature structural applications; processing equipment for food, pharmaceuticals, and other products; and parts of aircraft jet engines which are subjected to both high stress and high temperatures.

Platinum Metals

A 7th century B.C. metallic casket from Thebes, Egypt, was found to be made of a platinum alloy. Pre-Columbus Indians in Ecuador produced white alloys of platinum and gold. Because of its high melting point, attempts to fuse native platinum were unsuccessful until 1752 when Henric T. Scheffer (Swedish) succeeded with the aid of arsenic. In 1752 Scheffer published a detailed description of platinum or "white gold." This platinum was in reality an alloy of platinum and one or more of the five metals of the platinum group: palladium, rhodium, ruthenium, iridium, and osmium.

Pierre-Francois Chabanleau (French) succeeded in making pure, malleable platinum in 1783 while in the employ of the King of Spain. In 1803 Dr. William Hyde Wollaston (English) separated two new metals from platinum. He named one "palladium" in honor of the recently discovered asteroid, Pallas, and the other "rhodium" for the rose color of its salts. Smithson Tennant (English and son of a clergyman, as was Wollaston) discovered osmium and iridium in 1803-04. Osmium was so named because of the chloride-like smell of its tetroxide, and iridium was named for the varied colors of its salts. Osmium, with a density of 22.6 grams per cubic centimeter, is the heaviest metal known. Ruthenium came to light in 1844. It was discovered by Karl Karlovick Klaus (Russian). "Ruthenia" means Russia.

Platinum usually occurs in nature as the native metal alloyed with one or more of its allied metals. Up to 1915, more than 95 per cent of the world's supply of the metal was derived from alluvial deposits in Russia, Columbia, and Ethiopia. Since then, increasingly large amounts of platinum have been derived from lode deposits, first in South Africa and still later from the copper-nickel deposit of Sudbury, Ontario.

The platinum metals have superior wear resistance, exceptional chemical inertness, high-temperature stability, peak catalytic activity, low vapor pressure, high melting point, high ductility, strength at high temperatures, low coefficient of thermal expansion (about the same as glass), stable thermoelectric behavior, high-temperature coefficient of electrical resistivity, and high resistance to spark erosion. Use is based upon one or more of these properties. Major uses are in the jewelry, chemical, electrical, and dental industries. Minor applications are in electroplating, photography, pen points for fountain pens, radio tubes, explosives, medicine, and dyeing.

Selenium and Tellurium

Because of their close metallurgical association, selenium and tellurium are considered together. Tellurium was discovered by Rumanian-born Viennese chemist, Franz Joseph Müller, in 1782. The name was suggested by Martin H. Klaproth and means "earth." Selenium was discovered in 1817 by the great Swedish chemist and famed teacher, Jöns Jacob Berzelius, who also discovered silicon, thorium, cerium, and zirconium.

Frank A. Crossley is Senior Metallurgist with the Armour Research Foundation of the Illinois Institute of Technology, Chicago. This article is published to implement the intent of the Jackling Bequest to the Western Society of Engineers.

All selenium and tellurium of commerce is produced as a by-product from some other industry. The major sources of the two metals are the copper, the nickel-copper, and the lead industries.

Selenium finds application in light-sensitive cells which are used as smoke detectors, burglar alarms, door openers, counters and exposure meters for photographic work. It is useful in the glass industry as a color agent. Selenium and tellurium have been used in recent years to replace much less costly sulfur as a rubber cure. Benefits claimed are shortened curing time, increased strength and abrasion resistance, and improved aging qualities. Tellurium in small amounts has been found to greatly improve certain properties of lead. A potential use for tellurium is in thermoelectric devices to convert heat energy to electricity.

Silver

Since silver rarely occurs uncombined, it did not come into as early use as gold. In Egypt between the 13th and 15th centuries B.C. it was rarer and more costly than gold. Less than 1 per cent of the world's production of silver is from placer deposits. Sometimes an ore is valuable for its silver content alone; however, the larger proportion of the world's supply is recovered as a by-product in the refining of lead, copper, and zinc ores.

Pure silver is highly malleable, has high electrical and thermal conductivity, and is corrosion resistant. Coinage is one of the oldest uses for silver and continues to this day. Major industrial uses for silver are: jewelry, silverware, photographic goods, solder and brazing alloys, insignia, electrical contacts and other electrical products, dental uses, and pharmaceuticals.

Tantalum and Columbium

Tantalum and columbium are very closely related and invariably occur together in minerals. Columbium (or niobium, as it is called in Europe) was discovered as the oxide in 1801 by Charles Hatchett (English) in a black rock found in New England. Hatchett named it for the country in which it was found. (At that time America was also known as Columbia.)

Tantalum was discovered in 1802 by Anders Gustaf Ekeberg (Swedish) when he analyzed the minerals yttrotantalite and gadolinite. The metal was so named by Ekeberg because it had been such a tantalizing task to trace it down. In 1809 Dr. Wollaston concluded that columbium and tantalum were identical. This was accepted by chemists until 1846 when Heinrich Rose (German) proved them to be separate and distinct.

While many minerals are known to contain these metals, until very recently important ores contained a single mineral called tantalite when tantalum predominates and columbite when columbium predominates. There are no large tantalite-producing mines in the United States. However, Kennecott Copper Corporation is presently concentrating columbium from plentiful, low-grade ores in pilot plant operations. Minerals which may be used in the process are pyrochlore, perovskite, and euxenite.

The uses of tantalum are influenced more by its dominant or unique properties than by any other factor. The most important of these properties is its remarkable resistance to acid corrosion. The metal is completely resistant to hydrochloric and nitric acids and their mixtures at all temperatures and concentrations at atmospheric pressure. Another property, which both aids and limits tantalum, is its ability to absorb all common gases, in some cases at temperatures as low as 175° C. (347° F). This property is utilized in electron-tube applications to help maintain the high vacuum required. Tantalum can be fabricated and welted.

The largest single use of tantalum is in industrial chemical equipment. Much is used in the electronic industry. Other important uses are in surgery and in the manufacture of electrolytic rectifiers and capacitors.

Because of its high melting point, 2996°C (5425°F) there is some research effort directed toward alloying the metal to improve its strength at high temperatures and reduce its rates of oxidation and contamination in gaseous environments. These efforts are motivated by the high temperature material needs of modern air weapons.

With few exceptions, uses for pure metallic columbium have not developed to any great extent. In general, the applications for which it would be used are better served by tantalum. However, because its density is approximately half that of tantalum, a potential application is for highly stressed parts in the high-temperature zone of jet engines. In such applications strength-to-weight ratio is a primary consideration. Like molybdenum, columbium must be protectively coated for such use. However, since its oxidation resistance is much superior to that of molybdenum, at present it is more promising than molybdenum.

Tin

Tin was among the spoils of war which the Israelites took from the Midianites (Num. 31:21-23). It was alloyed with copper to make bronze long before metallic tin was known. In Mesopotamia, in the Indus Valley, and in Egypt alloys of copper and tin were made 300 years before Christ. The early Romans coated copper and bronze vessels with tin to make them more suitable for containers of food and drink.

The United States has always been dependent upon foreign sources to fill its needs for tin. The most important ore is the mineral cassiterite (SnO_2). Most of the world's production comes from alluvial deposits located in Indonesia, Malaya, Thailand, Burma, China, Nigeria, and Congo. In Bolivia, England, China, and to some extent in Malaya and Indonesia, tin occurs in lodes underground.

Basic properties which determine tin applications are: corrosion resistance (especially to organic acids), low melting point 232°C (450°F), alloying characteristics, and pleasing appearance. Major uses for tin are alloying with copper to produce bronze, tin plate for the packing and preservation of food, solder, babbits (bearing alloys), foil, and collapsible tubes. Tin as a coating medium has extensive application in the dairy, brewing, paper, and confectionery industries.

Titanium

In 1791 Reverend William Gregor (English) discovered the mineral now called ilmenite ($FeTiO_3$) and concluded that it contained a new metal. In 1795 Klaproth confirmed that the mineral contained an unknown metal oxide which he named "oxide of the titanium" from mythology and, in particular, from the Titans, the first sons of the earth.

Titanium is 63 times more abundant in the earth's crust than copper and about 160 times more abundant than zinc. Titanium mineral deposits of suf-

ficient concentration and magnitude for commercial mining are found in many parts of the world, including the United States. The United States is the world's largest titanium producer. There is no foreseeable shortage of titanium minerals in the world.

The exceptional properties of titanium which determine its use are light weight (60 per cent of the density of steel), corrosion resistance, and oxidation resistance to temperatures of 650°C (1200°F).

The most important use of titanium is in military and commercial aircraft and missiles. The titanium version of the widely used J-57 military jet engine shown in Figure 2 weighs 443 pounds less than its steel counterpart. In military planes weight savings cannot be valued in dollars. However, estimates of the worth of a pound saved in a transoceanic commercial airplane have gone as high as $240. The new jet-powered Convair 880 passenger airplane contains 1000 pounds of titanium estimated to have saved at least 800 pounds in weight. Use of titanium in applications requiring corrosion resistance and the chemical industry is slowly growing, and it is here that the greatest potential lies. The rapid expansion of the titanium industry has been accompanied by a 50 per cent reduction in prices in the past six years. Of the 3100 tons of mill products manufactured in 1959 it is estimated that 15 per cent was intended for use in missiles and space projects, and another 15 per cent in civilian use—primarily in the construction of commercial aircraft such as the Douglas DC-8, the Boeing 707, the Lockheed Electra, and the Convair 880.

Tungsten

Tungsten (or wolfram) was first recognized in the minerals wolframite and scheelite. The possibility of obtaining a new metal by reducing tungstic acid was suggested by Torbern Bergman in 1781. Later that year Scheele obtained the metal by decomposing the mineral.

Of the four tungsten minerals: wolframite [$(FeMn)WO_4$], scheelite ($CaWO_4$); ferberite ($FeWO_4$), and hubnerite [$(Mn)WO_4$], the first two are the most important. They are usually of low grade and must be concentrated. Principal ore sources are China, the United States, Bolivia, Burma, and Portugal.

The first and most important use of tungsten is represented by the filament of the incandescent lamp. Properties upon which this application depend are: high melting point, 3400°C (6150°F, relatively low vapor pressure, and sufficient strength both hot and cold to serve as a filament as small as 0.0005 in. in diameter. Other important uses of tungsten are in tool and die steels and cemented tungsten carbide alloys for wire-drawing dies and cutting tools for very hard, tough, or abrasive metals and nonmetallic articles. Minor uses are targets in X-ray tubes and electrode alloys for contacts in electric welding.

Uranium

The earliest suspected application of

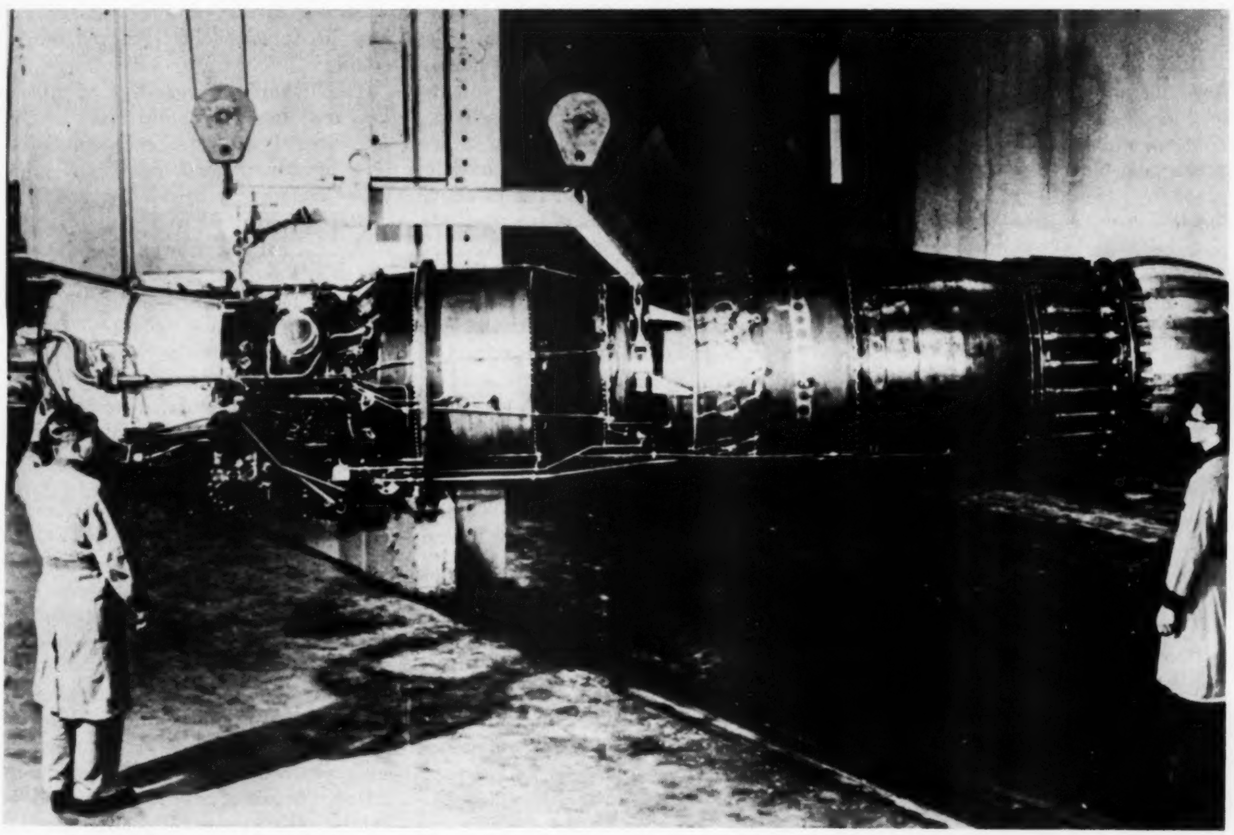

FIG. 2—PRATT & WHITNEY AIRCRAFT J-57 JET ENGINE. The titanium version of this engine saves 443 pounds over its steel counterpart. (Photo courtesy of the Crucible Steel Company.)

uranium was as the oxide to impart a pale green color to glass found in a mosaic mural excavated from the ruins of the Imperial Roman Villa on the Bay of Naples. Man's greatest task today is to prevent the final employment of uranium and uranium derivatives to create a world-wide ruin. The analytical work of Klaproth foreshadowed the discovery of uranium. He first recognized the existence of the new metal. For more than 50 years the uranium oxide he produced from pitchblende was believed to be the metal because of the great difficulty of its reduction. The metal was first isolated by Eugene-Melchior Peligot (French) in 1841.

Uranium is about as abundant in the earth's crust as copper and lead, but it is less well concentrated by geological processes. In 1959 the United States produced 6,800,000 tons of uranium ore valued at $140,000,000. The sole uses of uranium are as fuel for the generation of atomic energy and as breeder material to produce plutonium, which in turn is used as fuel.

Vanadium

In 1801 Andres Manuel del Rio, professor of minerology in Mexico, examined a specimen of brown lead from Zimapan and concluded that it contained a new metal similar to chromium and uranium which he named "erythronium." Later he decided that he was mistaken and that the metal was chromium. In 1831 Nils Gabriel Sefström (Swedish) discovered vanadium in a sample of cast iron from ore of the Taberg mine in Småland. Sefström's vanadium proved to be identical to del Rio's erythronium.

Vanadium is widely distributed, but the only massive deposits known are in Colorado, Utah, and Arizona and in Peru. Ores in the United States are principally carnotite and roscoelite. The former is a uranium-vanadium vanadate containing approximately 52 per cent UO_2 and 18 per cent V_2O_5.

Pure vanadium has no outstanding properties that make it unique or very attractive from an engineering standpoint. What virtues it does have are either possessed in greater measure by other metals or matched by less expensive materials. The most important use of the metal is as an alloying addition for steel. In steels it strengthens the alloy by dissolving in ferrite, produces a finer and more uniform grain size, and minimizes the tendency to grain growth in heat treatment; and as a carbide-forming element it forms very stable carbides that add to the strength and hardness of the steel and show little tendency to segregate, or to form large masses at elevated temperatures. A minor use is as a catalyst in the synthesis of chemical compounds. Vanadium's occurrence in coals, asphalts, bitumens, and oils is presumed to be not accidental, but due to its functioning as a catalyst in the conversion of organic matter into these compounds.

Zinc

Pliny the Elder (Roman 23-79 A. D.) and Dioscorides (Greek, c. 50 A. D.) mentioned that zinc compounds were used for healing wounds and sore eyes. In the 13th century Marco Polo described the manufacture of zinc oxide in Persia. Centuries before zinc was used in metallic form, its ores were used for making brass. An idol containing 87.5 per cent zinc was found in a prehistoric Dacian ruin in Transylvania. It is probable that the art of smelting the ore originated in India and was first carried to China. The *Rasarnava*, which was published in India in the 13th century A. D., states that metallic zinc is prepared by reducing calamine in a closed crucible with organic substances such as lac or wool. A hundred years before zinc was smelted in Europe it was being sold there by Portuguese traders who brought it from the Orient.

Zinc is produced from five minerals: sphalerite (ZnS), calamine [$Zn_2(OH)_2SiO_3$], smithsonite ($ZnCO_3$), zincite (ZnO), and franklinite ($ZnO,MnO) \cdot Fe_2O_3$. Since 1910 the United States has been the largest producer of zinc in the world. The ores in this country average 3 per cent zinc, and the reserves are very large.

Its position relative to iron in the electrochemical series determines the largest single application for zinc, that is, as a coating on steels to protect them from atmospheric corrosion. The process of applying the thin coating is called galvanizing. The large use of zinc die castings is based upon its low melting point, 419°C (786°F), which permits the use of ordinary steels in the construction of dies, and upon the good strength and toughness of zinc alloys. Automobile trim and housings for consummer items such as electric drills, electric mixers, and movie projectors, are typical die cast parts. Another large use of zinc is as an alloying addition to copper to produce brass. There are numerous uses for zinc rolled sheets and plate. These include dry cells, plates for photoengraving and lithography, sacrificial anodes to protect steel in underground structures, in sea water, and in water. In Europe rolled zinc is used extensively as a roofing material.

Zirconium

In 1789 Klaproth discovered zirconia in zircon ($ZrSiO_4$), and in 1824 Berzelius produced the metal. Zirconium of 100 per cent purity was not obtained until 1914 when D. Lely, Jr. and L. Hamburger of Holland reduced the tetrachloride with sodium.

Zirconium minerals are widely distributed in nature. They have been used since Biblical times as precious stones. The most important ore is zircon which is recovered from placer deposits in Australia, Brazil, and Florida. Brazil also produces baddeleyite, native zirconia.

The important properties of zirconium are: low absorption cross section for thermal neutrons, excellent corrosion resistance, good mechanical properties including fabricability, and high melting point.

Annual consumption of zirconium as metal and zirconium-base alloys in the United States is only about 10 to 15 per cent of the total produced. Of this amount perhaps 90 per cent or more goes into the construction of nuclear reactors as a structural material, as an alloying metal to increase the bulk or modify the properties of the fuel, and as a clad to protect the fuel and to prevent contamination of the heat-transfer medium by radioactive products. The minor uses of the metal are in the construction of chemical equipment, vacuum tubes (as a "getter" for absorbing gases), and electrolytic condensers and rectifiers.

The use of zirconium as an alloying addition to steels accounts for most of the consumption. It is used primarily to improve deep-drawing properties by fixing the nitrogen contained, and to inhibit grain growth. Zirconium is added to magnesium alloys as the tetrachloride to refine the grain size, improve

extrudability, and increase strength, particularly elevated temperature strength. Such alloys contain zirconium in amounts up to 0.7 per cent.

Conclusion

Since prehistoric times man has been learning to use metals more efficiently, more effectively, and more broadly. The process continues, but at a greatly accelerated rate since the close of World War II. There is constant research in the area of the common metals to develop alloys possessing new combinations of properties, and alloys duplicating the properties of available alloys but with the additions of lower cost. In the area of the uncommon and less known metals, efforts are devoted to determining their properties in order to discover any uniqueness that may be utilized to fill the gaps in material needs occasioned by the ever-increasing demands which spring from the creations of design engineers. The effect of these exotic metals, as alloying additions, on properties of the common metals is under investigation as well, to see what improvements can be wrought. Many uncommon metals which possess outstanding properties but which have one or more serious shortcomings preventing or restricting their application are the subjects of intensive investigations to eliminate, or at least mitigate, the undesirable characteristic. So while the number of metallic materials in the service of mankind are legion, there remains much work to be done. New materials for old applications, new applications for old materials, and new materials for new applications will be the pattern for a very long time to come. In fact, one can foresee no end to it.

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3. M. L. Weeks, *Discovery of the Elements*, 6th Ed., Journal of Chemical Education, Easton, Pa., (1956).
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Prestressed Concrete Approved

The use of prestressed concrete has been approved in Chicago for various types of construction except for industrial plants where there is greater than average risk of intense fire, according to Randall M. Dubois, president of the Prestressed Concrete Institute, on Sept. 7.

The decision by the City of Chicago Commission of Buildings came after recommendations by an advisory committee of architects and fire experts. It also followed study of a 400-page analysis covering tests made in England, Holland, California and Chicago Underwriters' Laboratory tests.

"As a result of this decision," declared Mr. Dubois, "it appears that designers, builders and engineers may now make far greater use of prestressed concrete for construction in the Chicago area. This should help bring about a greater utilization of various design and construction features, which have already proved themselves successful.

All prestressed precast concrete slabs, beams and girders must be tested and certified, in addition to their acceptance by the Chicago buildings commissioner, under the new ruling. Minimum concrete coverage surrounding the steel must be from 1½ to 2 inches.

Aspects of our World Stategy

By
Colonel John Slezak

We are living in turbulent times, and the establishment of a firm and enduring peace throughout the world, based upon honor and justice among all nations, is the indispensable requirement for the survival of our civilization.

Internationally speaking, in the past when we ran out of arguments and/or patience, we slugged it out and, thus by might and cunning, established the prevailing right. Sure enough, the solution was always of temporary nature—today's winner was tomorrow's loser, and thus it went on for decades and for centuries. While the details varied a little with time, environment and circumstances, the principle approach remained the same — the might decided what was right. However, the startling scientific and technological developments of the past fifteen years bring us face to face with the sudden realization that the old concept of settling our differences by force no longer works—not when nuclear weapons are used. We may still destroy our enemy but, at the same time, destroy our friends and ourselves Where is the payoff in pursuing such a course? There must be a better way, and there is.

Of course, it would be presumptuous on my part to pretend that I can bring to this well-informed audience a developed solution to this tragically important problem. The subject of relationships of man to man, group to group, nation to nation has been talked about, studied about, researched about and written about for centuries. Our libraries are filled with books and reports dealing with it. Yes, we have done just about everything except put our knowledge into constructive use and practice. In other words, our knowledge about ourselves has been advancing at a terrific pace, but our wisdom to use it has been lagging tragically behind.

During the past two years, more than ever, we have been hovering between two extremes—extreme pessimism and extreme optimism. But, it seems to me that the facts of life do not justify either of these extreme attitudes. I am thrilled even now when I think of my first reactions to the life and to the wonderful people of this country. From an individual's point of view there is not now and there never was anything so wonderful in the entire history of mankind, and we have the people and the means to preserve it, if we are willing to be objective—to recognize the problem and work intelligently towards its solution. Remember, the greatest and most lasting satisfactions in life come in striving and not necessarily in arriving.

Since, under our constitutional setup, the President is the chief architect of our National Strategy, I go to him for the basis of my approach to this problem.

On September 10, 1956, when launching the People-to-People Program, he made these statements to about eighty selected men and women:

"The purpose of this meeting is to help build the road to an *enduring peace.* — A particular part of the work that we expect to do is based upon the assumption that no people, as such, want war—that all people want peace.

"If we are to take advantage of the assumption that all people want peace, then the problem is for people to get together and leap governments—*if necessary to evade governments* — to work out not one method, but *thousands of methods* by which people can gradually learn a little bit more of each other.

"In short, what we must do is to widen every possible chink in the Iron Curtain and bring the family of Russia, or of any other country behind that Iron Curtain, that is laboring to better the lot of their children—as humans do the world over—closer into our circle, to show how we do it, and then to sit down between us to say, 'Now, how de we improve the lot of both of us.'

"In this way, I believe is the truest path to peace. All of the other things we do are mere palliatives or they are holding the line while constructive forces of this kind take effect.

"Every bomb we can manufacture, every plane, every ship, every gun, in the long-run has no purpose other than negative; to give us time to prevent the other fellow from starting a war, since we know we won't."

In other words, what the President said is that, relatively speaking, all people want peace, that peace is the common denominator of all human hopes and aspirations, and that permanent peace cannot be attained by force of arms, but human nature being what it is, it can be attained through human understanding.

It is in the light of these pronouncements that I would like to comment on our National Strategy. As we all know, in the past our relations with other nations have been characterized often by a sense of self-righteousness and, to a degree, by a sense of absolute right or wrong. For instance, we fought World War I to *end all wars*. World War II we were fighting to make the world *safe for democracy*. The implication being that if all people adopted our way of life the international strife would come to an end. We were conveniently forgetting that, human nature being what it is, we were having some conflicts and strife right here at home.

Now, what type of National Strategy would tend to accomplish the President's objectives, which I quoted earlier?

First, I believe we must define clearly and in simple terms what we are after—what are our objectives, and our definition should be such that, regardless of his or her background, each individual exposed to it should be able instantly and instinctively to relate it to his own self-interest. Now, the fundamental objectives of American policy today have been expressed in so many different ways that it is no wonder not only the outside world but, we ourselves, are confused about it. As I see it, *the preservation of American liberties and the development of a workable system of international organization and law just about covers it.*

Or, to put it still another way, since the *individual* is the basis of our social and economic setup we want to preserve for ourselves and for our children an environment that tends to insure us the greatest degree of *individual* opportunity.

Obviously, all elements of our National Strategy should be judged on the basis of whether they tend to support or detract from the above-stated principle.

Colonel John Slezak, former Undersecretary of the Army and a member of the Western Society of Engineers, presented this address before a luncheon meeting of the Society on June 29, 1960.

Reason for clear and precise statement of objectives:

1. So that we may have a point of reference for our plans and actions (on the Local, State, and Federal level).
2. So that others may more easily understand us. We are grossly misunderstood and woefully inarticulate about National objectives.
3. For our own better understanding of what we are and where we are going.

Second, it is imperative that we make concerted effort in our own plans to recognize the other nations' self interest from *their own point of view.*

Third, I believe that history has proven beyond any question of doubt that international treaties, contracts, or private agreements are only pieces of paper unless they are based on the enlightened self interest of the parties involved. As a matter of fact, enlightened self interest of the parties involved should always be the basis in planning our methods and actions to be taken to attain our objectives. You cannot, over a long period of time, work successfully against the instinct of self-preservation.

Fourth, instead of the sense of absolute that has characterized so much of our international relationships we may well give more consideration to relative values when we deal with other nations.

Their standards—ethics.

Sense of justice—right or wrong.

William James said: "The first thing to learn in intercourse with others is non-interference with their own peculiar ways of being happy, providing those ways do not assume to interfere by violence with ours."

Fifth, several years ago I had a lengthy discussion with Marshal Tito about our respective ways of life. He, in common with many others in Europe—and for that matter in the world—was very much concerned that sooner or later we will inadvertently blunder the world into another World War. In parting, he very earnestly said to me, "Mr. Slezak, wars do not solve problems, they only create more and bigger problems."

Our own recent experiences with World War I and World War II should be good examples to us. What did we settle? Do we have fewer and simpler problems as a result of us being winners in those wars? Of course not!

But, since no problems involving humans are ever settled *permanently* by force, I believe that we should always have the courage and intellectual integrity to be objective and face the facts as they are, and our methods and techniques should take this into consideration. For instance, from the times immemorial, we have been relying on leader-to-leader or government-to-government principle technique in our relationships with other nations, but I believe that the developments in the art of communications justify more and more exploitation of the individual-to-individual or the people-to-people approach.

Sixth, I believe we should take a close look at ourselves and make a basic evaluation to determine to what extent our internal way of life and practices are consistent with our preachments to the outside world.

I am sure that there is no secret or mystery about our many basic practices becoming more and more Socialistic in fact, although not in name. The outside world sees it, so why do we kid ourselves about it. About a year ago, India's Prime Minister, Nehru, said on a TV program that the United States has more social controls than India. And it is also rather evident for anyone who cares to see that because of the lack of interest and lack of a sense of responsibility on the part of our individual citizens we are becoming more and more centrally controlled.

Our present critical situation brings to my mind a prediction that was made more than 100 years ago. In 1847, Lord Macauley wrote a letter to Mr. Randall, a biographer of Thomas Jefferson. In

this letter, among other things, he said: "Your Republic will be as dreadfully plundered and laid waste in the Twentieth Century as the Roman Empire was in the Fifth Century, but with this difference — the Huns and vandals who ravaged the Roman Empire came from without; while your Huns and vandals will have been engendered within your own country by your own institutions."

Seventh, it may be well for us to recognize that, internationally speaking, our big problem is *Russian Imperialism* and not Communism which, after all, is only a tool of the former. But, to prove my point, let us look at the record. Since 1939, Russia has annexed approximately 684,300 Km² area with population before annexation of approximately 25,000,000 people. Among these were included Rumanian Provinces, Estonia, Latvia, Northern East Prussia, Eastern Czechoslovakia, Eastern Poland and others. And, what is equally important, during this same time Russia got under its control—but without annexation—approximately 12,500,000 Km² area with population of approximately 530,000,000 people. Among these were Albania, Bulgaria, Czechoslovakia, Hungary, China, Outer Mongolia and others. In other words, since 1939, Russia got under its control or, under a positive influence approximately 13,200,000 Km² of land area with a total population of approximately 575,000,000 people.

Now, while Russia was swallowing country after country either by annexation or subversion, what was the so-called Capitalistic Western Free World doing. During this time, India, Pakistan, Ceylon, the Philippines, Burma and Israel have become free and independent nations. They have adopted domestic and foreign policies which are of their own choosing and making. In other words, while Russia either annexed or otherwise got under her positive influence or control approximately 575,000,000 people, the Western Free World gave independence and freedom to approximately 545,000 people. Let us keep it in mind.

In our effort to win friends and be better understood, it may be difficult to fight Communistic idealogy, but not so difficult to fight Russian Imperialism.

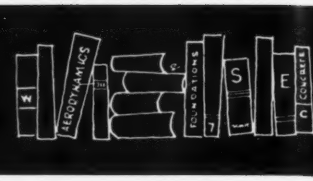
Eighth, as a part of our National Strategy to face current and probably future world situations, we should clearly define the part of the individual in this program and, by the same token, we should clearly define the roles of various organized segments of our society to be played in this program. Remember, it is the fundamental principle of our way of life that to retain it we must practice it. Our republic is founded on the proposition that it is a dynamic expression of a living, participating, informed free people. It is a way of life that belongs to the people, that draws its very life blood from popular participation. And, whatever our National Strategy may develop into, for it to be successful in our environment, *it must include a complete citizen-understanding of the problems involved and complete citizen participation in their solution.*

And, *ninth*, I believe the time has come that we should dare to be inconsistent, if necessary, and not defend our errors for the sake of consistence. We should make facts and truth the basis for whatever programming we do and certainly not emotions and prejudices.

In conclusion, every day that goes by I am more and more convinced that in carrying this or any other policy, your chosen leaders, from the President on down, can be only as effective as is the support each and every one of us is willing to give them. Our way of life derives its strength from active participating citizenry. Without it we have nothing.

Our international policy must inevitably stem from our ideals, from our way of life, and whatever the demands may be upon us in its day-to-day application. Please remember that our country not only is worth fighting for—it is worth working for.

Reviews of Technical Books



Induction Heating

Basics of Induction Heating, by Chester A. Tudbury. Published by John F. Rider, Inc., New York 11, N. Y. Pages, 284. Price, $8.90.

This book is written as a new visual presentation of the fundamental principles of the induction heating art and of commercial induction heating equipment. It describes and explains the operation of the more common types of industrial induction heating machines in use today and deals with electrical and thermal aspects in detail and touches upon some of the mechanical problems associated with fixturing.

The author has employed the "pictured text" approach. This style of presentation makes it readily understandable to any reader who is familiar with the basic laws of electricity. Numerous examples are given that use practical numbers which tie the contents to the daily requirements of the person who is, or eventually will be, working with induction heating equipment. Review questions are given at the end of each section, and a glossary is included for easy reference.

Intended for students in High Schools, Technical Institutes, and industrial training courses, this text is useful for shop men engaged in operating, maintaining, and tooling induction heating equipment.

W.L.R.

Surveying

Surveying Instruments and Methods, by Philip Kissam, professor of Civil Engineering, Princeton University, published by McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 36, N. Y. Pages, 482. Price, $6.50.

Surveying Instruments and Methods is a reliable guide to more accurate field surveying. It explains clearly all the instruments and methods used in making every major kind of small area survey. It gives practical directions for mapping and measuring, aligning machines and tools accurately, and establishing close-tolerance dimensions for large products. This helpful manual describes in detail how each project should be planned, laid out, and completed. It explains each operation in logical steps that are illustrated for quick understanding and application.

Subjects covered include: Surveying and Its Applications, The Surveying Method, Horizontal Measurement, The Transit, The Use of the Transit, Adjustment of the Transit, Traverses, The Level and Benchmark Leveling, Adjustment of the Level, Leveling Procedures, Establishing Line, Optical Tooling, Topographic Surveying, Drawing Maps and Keeping Records, The Elements of the Use of Aerial Photographs, and Computation of Area.

Guided Missiles

Principles of Guided Missiles and Nuclear Weapons, Prepared by Bureau of Naval Personnel, 1959. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price, $2.00. Pages, 284.

This volume is the second of a three-volume series of texts dealing with Naval weapons. The first volume deals with conventional weapons while the third is a supplement to the second.

Although the book is intended for use in the Naval Science curriculum of NROTC universities, it will prove useful as a clear and concisely written introduction to the subjects named in its title. Because it is unclassified, the volume is limited to a general approach with little reference to actual weapons in current use. The basic principles of guided missiles and nuclear weapons are described with enough thoroughness to enable the reader to become conversant with the subject and retain enough background to go into more advanced aspects of either subject.

Each main subject is treated separately. Part I, containing eleven chapters, is devoted to Guided Missiles. Part II, composed of three chapters, deals with Nuclear Weapons. Part I covers a range of subjects beginning with the history of missiles and passing through the physics and aerodynamics of flight, missile components, propulsion systems, control systems, and guided missile ships and systems. Part II ranges from the fundamentals of nuclear physics and principles of nuclear weapons to nuclear weapons effects and atomic defense.

The volume is amply illustrated and contains an adequate index and glossary. It is, as are most government publications, well worth the price. It is both interesting and informative.

A.A.A.

Gyroscopes

Basics of Gyroscopes, by Carl Machover. Published by John F. Rider, Inc., New York 11, N. Y. Pages, 232. Price, $7.75.

A presentation of the physics, mechanics and applications of gyroscopes. All basic and important points are dramatically illustrated.

This text is primarily descriptive and mathematics are kept to a minimum with only basic knowledge of algebra and trigonometry needed for an understanding of the material. The material in the book is an outgrowth of the teaching efforts of the author and reflects his practical experience and methods of training.

Experienced gyro engineers usually have an adequate supply of information, but engineers, technicians, students, salesmen and managers who come in contact with gyroscopes in their work or studies have a need for a more descriptive, less complex discussion of the subject. This book should fill this need.

The "pictured-text" format is used enabling a forceful, yet lucid approach to gyro fundamentals. The book begins with an explanation of the construction of gyroscopes. It then advances to the commercial types and their utility for stabilizing purposes, in equipment commonly bound to the earth's surface. The author then details the changes in construction and design as required for application in space vehicles and missiles. Review questions are included at the end of each section.

W.L.R.

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WSE Applications

In accordance with Article 1, Section 5 of the By-Laws of the Western Society of Engineers, there is published below a list of applicants for admission received since the last issue of the MIDWEST ENGINEER *magazine.*

Robert T. Houdek, Plan'g. Engrg., Western Electric Co., Inc. Hawthorne Station.

Charles A. Martin, Designer-Estimator, American Bridge Div., U. S. S. Corp., 208 S. LaSalle Street.

Robert McAra, Specification Engr., Long-Airdox Company, 307 N. Michigan Avenue.

Carl Bolt, Chief Engineer, The W. J. Fitzpatrick Company, 1001 Washington Blvd.

Edward R. Dluzen, Sr. Elect. Engr., Western Electric Co. Inc., Hawthorne Station.

Stanley J. Miller, Dir., Plant Engrg. Div., Joseph T. Ryerson, Inc., 2558 W. 16th Street.

John W. Taylor, Engineer, Illinois Bell Telephone Co., 208 W. Washington Street.

W. J. Tornehl, Outside Plant Appraisal Engr., Illinois Bell Telephone Co., 208 W. Washington Street.

George E. Rodman, Suprvr., Education & Training, Commonwealth Edison Co., 72 W. Adams Street.

Lawrence R. Laffey, Sales Representative, Allis-Chalmers Manufacturing Co., 135 S. LaSalle St.

James M. Berry, 1936 Sheridan Rd., Evanston — attending Northwestern Technological Institute.

Bruce D. Hayward, 1936 Sheridan Rd., Evanston — attending Northwestern Technological Institute.

Jay E. Kennedy, 12032 S. 71st Av., Palos Heights—attending Northwestern Technological Institute.

Walter D. Olson, 4725 Grand Av., Western Springs — attending Northwestern Technological Institute.

Russell F. Diethert, 2261 Bracken Lane, Northfield — attending Northwestern Technological Institute.

John Kolberg, Draftsman-Jr. Designer, Vern E. Alden Company, 33 N. LaSalle St.

Marvin Salisbury, Soils Engineer, DeLeuw, Cather & Company, 150 N. Wacker Dr.

Claudius S. Barrett, Asst. Supt. (Engrg. Personnel & Coordination), Western Electric Co., Inc., Hawthorne Station.

John A. Anderson, Assist. Manager, Ingersoll-Rand Company, 400 W. Madison St.

Frank E. Dalton, Project Engr., Meissner Engineers, Inc., 300 W. Washington St.

John J. Kennedy, Senior Engr., Western Electric Co., Inc., Hawthorne Station.

Len J. Lembitz, Senior Engr., Western Electric Co., Inc., Hawthorne Station.

Roy Hoffman, Engineer, Illinois Bell Telephone Co., 208 W. Washington St.

J. Wilson Cook, Field Engineer, James G. Biddle Co., 1316 Arch St., Philadelphia, Penn.

R. A. Johnson, Project Engineer, Sargent & Lundy, 140 S. Dearborn St.

Richard E. Defreese, Training Assist., Northern Illinois Gas Co., 50 Fox St., Aurora, Ill.

Joe E. Thompson, Assist. Chief Engineer, Natural Gas Pipeline Company of America, 122 S. Michigan Av.

Keith Bentz, Executive-V. P.-Operations, Natural Gas Pipeline Company of America, 122 S. Michigan Av.

Harry R. Rohwedder, Director of Operations, Natural Gas Pipeline Company of America, 122 S. Michigan Av.

William R. Tatman, Gen. Plant Mgr.-Suburban Area, Illinois Bell Telephone Co., 212 W. Washington St.

L. D. Ermish; Supt., Equip. Engrg., Western Electric Co., Inc., Merchandise Mart Plaza.

James P. McShane, Head of Engrg. Div., Swift & Company, U. S. Yards.

New Electric Car

An electric car for the housewife doing neighborhood chores has been built by a Detroit laboratory, reports *Electrical World*. Designed for short-distance travel, the car weighs 447 pounds, is 24 inches high and has a one-third horsepower motor for each rear wheel. Top speed is 15 to 20 miles an hour. Its batteries require recharging every two hours.

Want Better Component Method?

"If you are looking for a better method for producing your small components, then bring your metal fabrication problems to the Investment Casting Clinic."

This is the invitation to J. H. Cadieux, Chairman of the ICI's Investment Casting Clinic Committee. Cadieux, president, Casting Engineers, states that the next industry sponsored investment casting clinic will be held at the North Park Hotel in Chicago on Nov. 1, 1960.

The Chicago clinic will be a full day session featuring workshop discussions and special investment casting displays. During the workshops, participants will have an opportunity to discuss pertinent questions with qualified technical personnel from the investment casting industry. Workshops will be held on such topics as: "Designing for Lowest Cost;" "Investment Casting Applications;" "The Economics of Tooling for Investment Castings;" "New Developments in Alloys for Investment Castings;" and "Recognizing Investment Casting Applications."

Hundreds of investment castings will be on display for study by those who participate in the Clinic. In addition, a copy of the new investment casting book: "How to Design and Buy Investment Castings" will be presented to all who attend the Clinic. There will be a nominal registration fee of $10.00 which includes luncheon.

Designers, process engineers, metallurgists and other technical executives who are interested in investment castings, and wish further information on this investment casting clinic to be held in Chicago on November 1, 1960, can contact the Investment Casting Institute, 27 East Monroe, Chicago 3, Illinois.

Professional Directory

News of Engineers

or: Personals of Personable People

Jon O. Nelson, a student member of the Western Society of Engineers, has been awarded a scholarship by Allegheny Ludlum Steel Corp. Mr. Nelson's home address is 1203 Sunset road in Wheaton, Ill.

•

Dr. A. Allan Bates, Western Society member, vice-president, Research and Development, Portland Cement Association, succeeded to the presidency of the American Society for Testing Materials. His predecessor, F. L. LaQue, vice-president and manager, Development and Research Division, The International Nickel Co., continues as past-president on the ASTM Board for three years.

•

Kenneth F. Wright, a member of the Western Society, has joined Chicago Molded Products Corporation as a technical sales representative for the Custom Molding Division of Chicago Molded Products Corporation, J. E. Johnston, vice president and manager, Custom Molding Division, announced.

Mr. Wright, whose home will be in Chicago, will cover one of the Chicago territories. He formerly was a technical sales representative for the Spencer Chemical Company's polyethylene division and the L. A. Darling Company's plastics division and handled market research and technical sales for the Indiana Forge and Machine Company.

He is a graduate of Purdue University, majoring in aeronautics, and is also a member of the Society of Plastics Engineers.

•

Western Society member **Georgiana Peeney** has been elected a director of the Northwestern University Alumni Association. She will serve for a term of three years. This is the first time that the alumni has been represented by a woman. Miss Peeney is also a member of the Chicago Section of the Society of Women Engineers.

•

Renato G. Barreto has been appointed an Associate of Paul Rogers & Associates, Inc., consulting engineering firm in Chicago.

Mr. Barreto obtained his master of science degree in Civil Engineering at the University of Notre Dame. He has recently obtained registration as a Structural Engineer in Illinois.

Conversant with several foreign languages, Mr. Barreto is a project engineer with the Rogers firm, and is expected to handle much of the firm's contemplated European projects.

•

Leith Johnston, a member of the Western Society, is now director of the industrial systems development department of Automatic Electric Laborator-

ies, subsidiary of General Telephone & Electronics at Northlake, Ill.

Johnston is responsible for directing the department, organized to provide research and development support for the industrial systems program of Automatic Electric Co.

Formerly a laboratories senior project engineer, he joined AE in 1927 as an inspector. During the 1930s, he served as general foreman, and night superintendent. Since joining the laboratories organization, his principal assignments have been in design work on totalizator and stock quotation boards, and development of fully automatic teletypewriter systems for the U.S. Army Signal Corps.

Johnston is a graduate of Reed College, Portland, Ore., and is a registered professional engineer of Illinois. He holds membership in the American Institute of Electrical Engineers, American Society for Metals, Armed Forces Communications & Electronics Association in addition to the Western Society of Engineers. He also has been credited with eleven patents in the totalizator and teletype switching fields.

•

C. A. Budnik, a Western Society member, formerly assistant manager of Industrial Construction for Kaiser Engineers at Oakland, Calif., has been appointed general manager of the Titan Installation and Activation Division of American Machine & Foundry Company's Government Products Group, it was announced by R. W. Cook, director of Field Services and deputy group executive.

For Kaiser Engineers, Budnik was responsible for all phases of Company field operations including budgetary requirements, methods and procedures of operation, equipment and personnel requirements, and the preparation of proposals and bid estimates for Kaiser projects in the United States as well as in Puerto Rico and Guam.

Prior to his Kaiser position, he was assistant to the vice-president of the Maxon Construction Company at Dayton, Ohio engaged in the installation of nuclear research reactors; consultant to the U.S. Corp of Engineers on technical and construction problems related to military air base installations in the Caribbean area; and tunnel resident engineer for the Pennsylvania Turnpike Commission at Harrisburg, Penn. responsible for construction of four major tunnels of the original Pennsylvania Turnpike.

Mr. Budnik is a member in many states of the Association of Professional Engineers and also in Canada. He is also a member of the American Society of Civil Engineers, and American Nuclear Society, besides the Western Society.

Column Research

Column Research Council of the Engineering Foundation has just published a "Guide to Design Criteria for Metal Compression Members" and will be glad to accept requests for a limited number of copies from the members of the Western Society of Engineers. The price for these copies will be $5.00 each.

Interested members are asked to place their order with Mr. Robert B. Harris, Secretary, Column Research Council, 313 West Engineering, University of Michigan, Ann Arbor, Michigan.

An infrared traffic monitor that can be installed in minutes will be used by engineers and law enforcement officials to study and control traffic, reports *Electronics*. The monitor can work on any type road, and can be moved from location to location to study traffic flow.

A California plant is using green stamps instead of money to pay for employee suggestions, reveals *Factory*. Output of ideas has doubled since the company first offered trading stamps as rewards.

Museum of History, Technology

The Smithsonian Institution's newest addition, a Museum of History and Technology now under construction in Washington, D.C., is becoming a showcase for American know-how and initiative—both inside and out.

Inside will be displayed the historically outstanding examples, both originals and models, of U. S. ingenuity: Whitney's cotton gin, Howe's sewing machine, Edison's electric lamp.

Outside, the building itself, on the Mall at Constitution Avenue and 14th St., serves as a more modern example of that same kind of ingenuity. Its unusual structural requirements have caused the men now erecting a framework—men of U. S. Steel's American Bridge Division —to pull some engineering rabbits out of their construction hats.

One big problem the designers faced was how to give the floors and ceilings not only twice the normal length and breadth but twice the strength as well.

"Because of the size and weight of the exhibits we intend to place there," a Smithsonian spokesman said, "the Museum floors must bear double the strains and stresses of floors in other large buildings.

"Another reason for floor strength is the span between supports. In most buildings, no more than 25 feet are required between supporting columns. But because the Museum is made up of many integrated exhibition halls, each one auditorium-shaped, the spans without supporting columns generally are about 50 feet."

To provide the needed strength, American Bridge is using steel beams weighing as much as 22 tons, about three times the weight of beams used in routine building construction.

"To safely erect the steelwork," pointed out Elmer Olson, veteran construction superintendent for American Bridge, "we have put up two big derrick cranes—65 feet tall with 120-foot booms and capable of hoisting up to 100 tons each—on either side of the building to work as a team in assembling the steel. The idea is to build the Museum as a unit, not section by section.

The big beams are being connected as if they were parts of a gigantic, interlocking jig-saw puzzle. The building is the "table" and manipulating the pieces on either side are the skeletal "hands and arms" of the towering cranes.

The cranes, too, put American Bridge ingenuity to a test.

"Trouble was," Olson explained, "the ground floor had to be poured in concrete first. Usually, the steel goes up, then the floors are poured. But the unique construction of the museum called for concrete before steel.

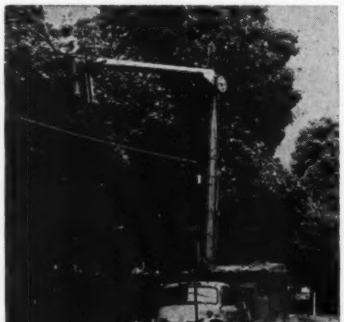
"Ordinarily, we would rest the cranes on the ground and maneuver them easily. But they are too much for the concrete, so we had to place them on runners, or tracks, along the outside edges of the second floor framework. This way, they can move from side to side. To anchor them and provide counterweight, we hooked the cranes to six 25-ton pontoons, which rest on the ground several yards from the building."

Before the steelwork is completed, probably late this year, Olson and his crews will have put 13,000 tons into their structural puzzle.

"That sounds like a lot of steel," Olson remarked, "but it's not so much when you consider the building will take up most of a city block and house such exhibits as trains and power machinery."

The Museum will contain not only new displays—featuring a 65- by 65-foot presentation of the original Star Spangled Banner—but also collections now overflowing the antiquated Arts and Industries building. To illustrate the number of exhibits to be installed, Smithsonian spokesmen point out there are more than 800,000 objects in the fields of history and technology already.

By spring 1962, the prime contractor, Norair Engineering Corp., is slated to have the building ready for occupancy. The Smithsonian will need the rest of the year to move in, and by January 1963, the Museum should receive the first of many millions of visitors, whose annual pilgrimages to the Smithsonian have made it, next to the Capitol and the White House, the greatest tourist attraction in a tourist's Mecca.



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